Sustainability of Digital Formats: Planning for Library of Congress Collections

PNG, Portable Network Graphics

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Format Description Properties

- ID: fdd000153
- Short name: PNG
- Content categories: still-image
- Format Category: file-format, encoding
- Other facets: unitary, binary, unstructured, sampled
- Last significant FDD update: 2024-05-07
- Draft status: Partial

Identification and description

Full name	PNG (Portable Network Graphics)
Description	The PNG specification defines both a datastream and an associated file format for a lossless, portable, compressed, raster (bit-mapped) image. PNG is fully streamable with a progressive display option. Indexed color, grayscale, and RGB color (referred to as *truecolor* in the specification) are supported, with optional transparency (alpha channel). PNG can store gamma and chromaticity data as well as a full ICC color profile for accurate color matching on heterogenous platforms. The PNG format was originally designed as an open standard to replace GIF_89a for use on the Internet, but is not limited to that use.
Production phase	May be an initial-state or middle-state format; more often used as final-state format.
Relationship to other formats	
Used by	IPA, iOS App Store Package
Has subtype	Has versions not separately described.

Local use

LC experience or existing holdings	As of August 2023, the Library of Congress has approximately 10 TB (over 31 million) PNG files in its collections across many divisions.
LC preference	The Library of Congress Recommended Formats Statement (RFS) includes PNG as a preferred format for photographs in digital form, other graphic images in digital form and 2D and 3D Computer Aided Design raster images. The RFS does not specify a version of PNG.

Sustainability factors

Disclosure	Open standard.
Documentation	PNG (Portable Network Graphics) Specification, Version 1.2 (at http://www.libpng.org/pub/png/spec/1.2/PNG-Contents.html) ISO/IEC 15948:2004 Information technology -- Computer graphics and image processing -- Portable Network Graphics (PNG): Functional specification. W3C Portable Network Graphics (PNG) Specification (Second Edition), same text as ISO/IEC 15948:2004, at https://www.w3.org/TR/PNG/
Adoption	As of 2005, PNG was supported by most browsers. However, Internet Explorer 6.x for Windows did not support the transparency feature. Slow deployment of full browser support delayed, or even prevented widespread adoption. With the expiration of the LZW patent, the original objective, a patent-free standard to replace GIF, is no longer significant. According to a webpage from May 2020 now available via Internet Archive, the National Archives of Australia preferred PNG as a "preservation format" for bit-mapped images and normalized at-risk image formats to PNG. The National Archives of Australia currently lists PNG as an acceptable preservation format for born-digital files and recommends lossless PNG as a minimum specification for business-as-usual digitization processes at government agencies. Library and Archives Canada has adopted PNG as a recommended format for still images.
Licensing and patents	None.
Transparency	Depends upon algorithms and tools for decompression to read; requires sophistication to build tools based on documentation.
Self-documentation	The PNG specification allows labeled text (ASCII or UTF-8) elements to be embedded in text *chunks* and predefines a few standard keywords (element labels): Title, Author, Description, Copyright, Creation Time, Software, Disclaimer, Warning, Source, Comment. The compilers of this resource are not able to assess the degree to which such metadata is found in practice or whether other keywords are in common use. An attempt in 2000 to develop open source tools to convert EXIF images (including EXIF metadata) to PNG seems to have been abandoned. See https://pmt.sourceforge.io/exif/drafts/d020.html. Without such tools and agreed practices, PNG can not rank highly for self-documentation. It is possible to embed XMP metadata in PNG files, according to the XMP specification. However, the documentation for ExifTool for PNG tags suggests that practices for storing XMP or EXIF metadata in PNG images have not been consistent. **Accessibility Features** Accessibility for still image content is often supported by the use of alt text when displayed on the web. The carriage of this data is typically not embedded in the file itself but rather in the HTML code. See W3C's Images Tutorial for the Web Accessibility Initiative. PNG files may have

	limited support for web accessibility because of its ability to store text strings associated with the image, including image description. However, this information may be not be accessible to screen readers.
External dependencies	None
Technical protection considerations	None

Quality and functionality factors

Still Image	
Normal rendering	Good support.
Clarity (high image resolution)	Excellent support, with support for progressive display for images retrieved over the Internet. The standard is flexible as to color space and bit depth, supporting indexed color, grayscale, and RGB color. RGB color data is often 8 bits-per-channel (24-bit RGB) but may be extended to 16 bits (48-bit RGB). The term *truecolor* is often used to refer to RGB color images with 24-bit or greater data.
Color maintenance	A PNG image can include *chunks* for gamma and chromaticity data and for a full ICC color profile.
Support for vector graphics, including graphic effects and typography	An alpha channel, representing transparency information on a per-pixel basis, can be included in grayscale and color PNG images. When transparency data is included in color images, the color space is sometimes called RGBA.
Functionality beyond normal rendering	None. Related formats, MNG and JNG, have been defined to support multi-page images and animation.

File type signifiers and format identifiers

Tag	Value	Note
Filename extension	png	The PNG standard recommends the use of png as extension.
Internet Media Type	image/png	See registration at IANA.
Magic numbers	Hex: 89 50 4e 47 0d 0a 1a 0a ASCII: \211 P N G \r \n \032 \n	Documented in PNG standard.
Mac OS file type	PNGf	Documented in PNG standard.
Pronom PUID	fmt/11	See https://www.nationalarchives.gov.uk/PRONOM/fmt/11 for PNG 1.0.
Pronom PUID	fmt/12	See https://www.nationalarchives.gov.uk/PRONOM/fmt/12 for PNG 1.1.
Pronom PUID	fmt/13	See https://www.nationalarchives.gov.uk/PRONOM/fmt/13 for PNG 1.2.
Wikidata Title ID	Q178051	See https://www.wikidata.org/wiki/Q178051. No version information.

Notes

General	
History	The original specification for PNG, version 1.0, was developed by the independent PNG development group and released under the auspices of

	the World Wide Web Consortium (W3C) on 1 October 1996 as its first Recommendation. On 15 January 1997 it was released by the IETF as RFC 2083. The PNG specification was updated to version 1.1 on 31 December 1998. It included new chunks for cross-platform color correction (sRGB and iCCP), a revised and much more sensible description of gamma correction, and a number of other minor improvements and clarifications (all fully backward compatible, of course!). A second, more minor update (version 1.2) was released in August 1999; its only change was the addition of the iTXt chunk (international text). Version 1.2 was submitted to ISO/IEC as a proposed standard in 1999. The ISO/IEC standard was published in March 2004 as ISO/IEC 15948:2004. W3C published equivalent text as *Portable Network Graphics (PNG) Specification (Second Edition)* at https://www.w3.org/TR/PNG/ in November 2003.

Format specifications

- PNG (Portable Network Graphics) Specification, Version 1.2 (http://www.libpng.org/pub/png/spec/1.2/PNG-Contents.html).
- Portable Network Graphics (PNG) Specification (Second Edition) (https://www.w3.org/TR/PNG/). From W3C.
- ISO/IEC 15948:2004. Information technology -- Computer graphics and image processing -- Portable Network Graphics (PNG): Functional specification

Useful references

URLs

- Portable Network Graphics (PNG) Home Site (http://www.libpng.org/pub/png/).
- PNG, The Definitive Guide (http://www.libpng.org/pub/png/book/). 1999 book by Greg Roelofs, originally published by O'Reilly. Released online by the author in 2003 (after going out of print), with minor updates.
- https://www.ietf.org/rfc/rfc2083.txt
- https://www.w3.org/Graphics/PNG/
- Images Tutorial. (https://www.w3.org/WAI/tutorials/images/). W3C documentation apart of their Web Accessibility Initiative.
- PNG Tags (https://exiftool.org/TagNames/PNG.html). From documentation for ExifTool by Phil Harvey
- Le Format PNG (http://pin.association-aristote.fr/lib/exe/fetch.php/public/presentations/2003/pin20030904format_png.pdf). 2003 presentation (in French) by Nicolas Lormant. Covers history and objectives.
- The Encyclopedia of Graphic File Formats, 2nd Edition, 1996 (EGFF) has information on this format. See print citation below. Online access is available at:
  - EGFF: PNG File Format Summary (https://www.fileformat.info/format/png/egff.htm). From FileFormat.Info. This presentation states that the work has been released under a Creative Commons Attribution license.
  - EGFF: PNG (https://web.archive.org/web/20180419133433/http://netghost.narod.ru/gff/graphics/summary/png.htm). Copy made available from a site in Russia. Available via Internet Archive capture from April 19, 2018.
- Library and Archives Canada recommended formats (https://www.bac-lac.gc.ca/eng/services/government-information-resources/guidelines/Documents/file-formats-irev.pdf).
- Born-digital file format standards (https://www.naa.gov.au/information-management/storing-and-preserving-information/preserving-information/born-digital-file-format-standards). From National Archives of Australia. PNG is listed as a preservation format under "Digital still image."
- PRONOM entry for fmt/11 (https://www.nationalarchives.gov.uk/pronom/fmt/11). Information in PRONOM from UK National Archives about PNG version 1. PUID: fmt/11.
- PRONOM entry for fmt/12 (https://www.nationalarchives.gov.uk/pronom/fmt/12). Information in PRONOM from UK National Archives about PNG version 1.1. PUID: fmt/12.
- PRONOM entry for fmt/13 (https://www.nationalarchives.gov.uk/pronom/fmt/13). Information in PRONOM from UK National Archives about PNG version 1.2. PUID: fmt/13.

- Wikidata entry for Q178051 (https://www.wikidata.org/wiki/Q178051). Information in Wikidata about PNG - no version information. Wikidata Title ID: Q178051.

Books, articles, etc.

- Murray, James D. and William vanRyper. Encyclopedia of Graphics File Formats, 2nd Edition. Sebastopol, CA. : O'Reilly & Associates, 1996. Includes CD-ROM with complete text of book, and copies of several file format specifications.

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